NASA'S MISSION TO PLANET EARTH

EARTH PROBES

DATA INFORMATION SYSTEM
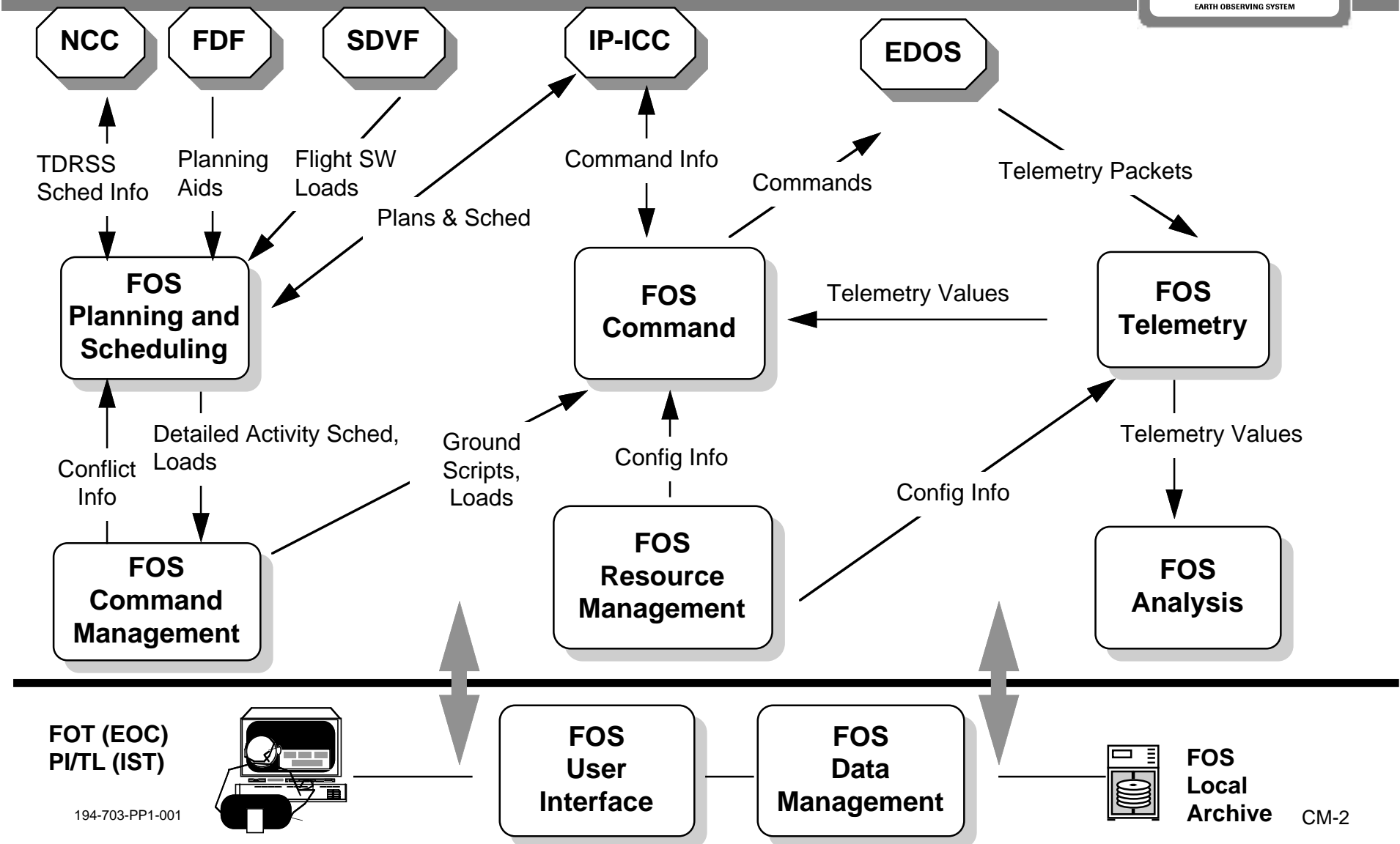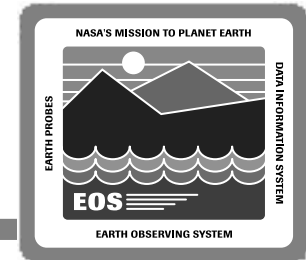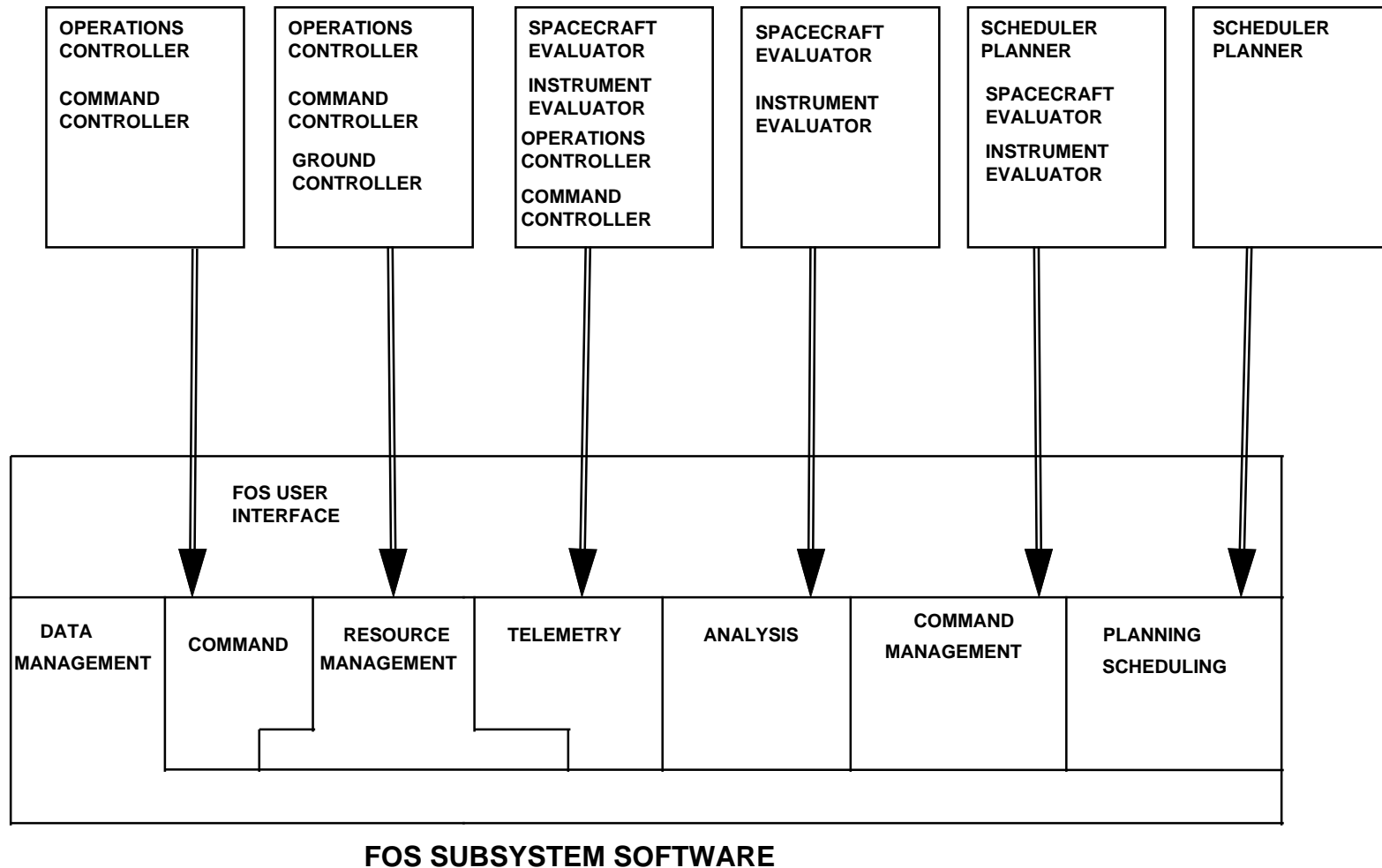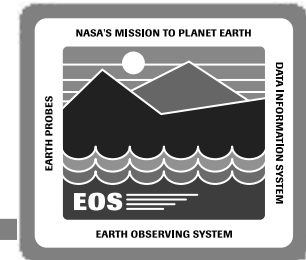
EOS

EARTH OBSERVING SYSTEM

Flight Operations Segment Summary

Cal Moore
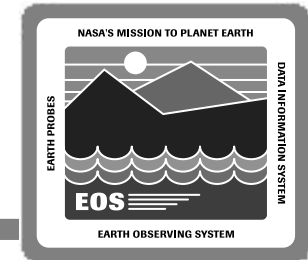
System Design Review - 28 June 1994

FOS High-Level Architecture

NASA'S MISSION TO PLANET EARTH

EARTH PROBES

DATA INFORMATION SYSTEM

EOS

EARTH OBSERVING SYSTEM

NCC

FDF

SDVF

IP-ICC

EDOS

TDRSS Sched Info

Planning Aids

Flight SW Loads

Command Info

Commands

Telemetry Packets

Plans & Sched

FOS Planning and Scheduling

FOS Command

Telemetry Values

FOS Telemetry

Detailed Activity Sched, Loads

Ground Scripts, Loads

Config Info

Config Info

Telemetry Values

Conflict Info

FOS Command Management

FOS Resource Management

FOS Analysis

FOT (EOC) PI/TL (IST)

FOS User Interface

FOS Data Management

FOS Local Archive

194-703-PP1-001

CM-2

EOC Staff On-Line

OPERATIONS CONTROLLER	OPERATIONS CONTROLLER	SPACECRAFT EVALUATOR	SPACECRAFT EVALUATOR	SCHEDULER PLANNER	SCHEDULER PLANNER
COMMAND CONTROLLER	COMMAND CONTROLLER	INSTRUMENT EVALUATOR	INSTRUMENT EVALUATOR	SPACECRAFT EVALUATOR	
	GROUND CONTROLLER	OPERATIONS CONTROLLER		INSTRUMENT EVALUATOR	
		COMMAND CONTROLLER			

FOS USER INTERFACE

DATA MANAGEMENT	COMMAND	RESOURCE MANAGEMENT	TELEMETRY	ANALYSIS	COMMAND MANAGEMENT	PLANNING SCHEDULING

FOS SUBSYSTEM SOFTWARE

EOC Staff On-Line

**OPERATIONS
CONTROLLER**

REAL-TIME S/C CMD & DATA CAPTURE MANAGEMENT.
EOC EXTERNAL COMMUNICATIONS MANAGEMENT.
OFF-SHIFT EOC MANAGER.

**COMMAND ACTIVITY
CONTROLLER**

REAL-TIME S/C CMD EXECUTION AND VERIFICATION.
SUPPORTS AND POST-PASS DATA PLAYBACK.
SUPPORTS PRE-PASS SYSTEM CONFIGURATION.

**GROUND
CONTROLLER**

LAN SUPPORT MANAGER.
DIRECTS EOC SYSTEM RECONFIGURATIONS AND
FAILOVERS PLUS GSFC DAAC INTERFACE.

SPACECRAFT EVALUATOR

REAL-TIME S/C CMD & TLM MONITOR AND ANALYSIS.
S/C ANOMALY DETECTION AND CONTINGENCY PROC.
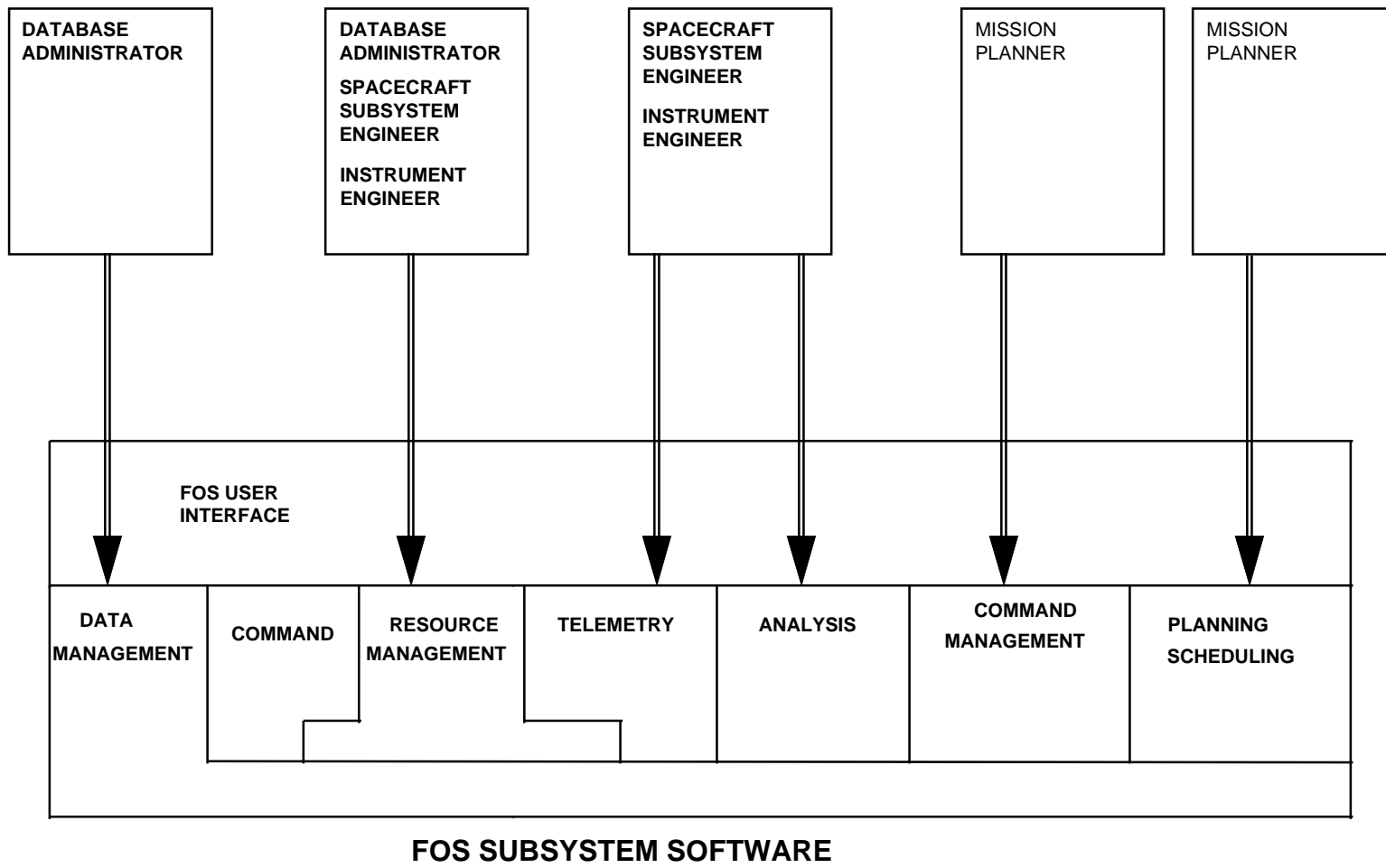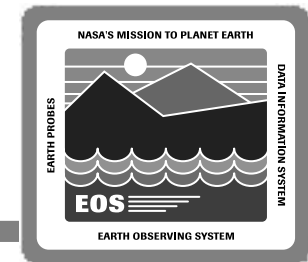EXECUTION.
PROVIDES TECHNICAL SUPPORT TO OPS. CONTROLLER

INSTRUMENT EVALUATOR

REAL-TIME INST. CMD & TLM MONITOR AND ANALYSIS.
INST. ANOMALY DETECTION AND CONTINGENCY PROC.
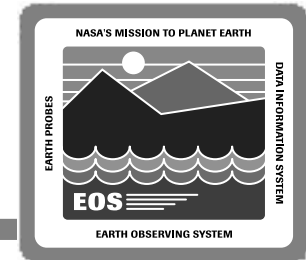EXECUTION.
PROVIDES TECHNICAL SUPPORT TO OPS. CONTROLLER

SCHEDULER

S/C AND INST. RESOURCE SCHEDULING.
NCC RESOURCE SCHEDULING.
TOO AND LATE CHANGE SUPPORT.
COMMAND LOAD GENERATION / VALIDATION.

EOC Staff Off-Line

DATABASE ADMINISTRATOR	DATABASE ADMINISTRATOR SPACECRAFT SUBSYSTEM ENGINEER INSTRUMENT ENGINEER	SPACECRAFT SUBSYSTEM ENGINEER INSTRUMENT ENGINEER	MISSION PLANNER	MISSION PLANNER

FOS USER INTERFACE

DATA MANAGEMENT	COMMAND	RESOURCE MANAGEMENT	TELEMETRY	ANALYSIS	COMMAND MANAGEMENT	PLANNING SCHEDULING

FOS SUBSYSTEM SOFTWARE

EOC Staff Off-Line

FLIGHT SYSTEMS ENGINEER

OVERALL HEALTH AND SAFETY OF EOS SPACECRAFT.
LEADS ANOMALY INVESTIGATIONS.
PROVIDES TECHNICAL DIRECTION TO FOT
PROJECT DATABASE CONTENTS.

OFF-LINE ENGINEER

HEALTH AND SAFETY OF SPACECRAFT SUBSYSTEM.
SUBSYSTEM ANOMALY INVESTIGATIONS.
DEVELOPS SUBSYSTEM CMD AND CONTROL PROC.
SUPPORTS SPACECRAFT TESTING.

INSTRUMENT ENGINEER

HEALTH AND SAFETY OF INSTRUMENT.
INSTRUMENT ANOMALY INVESTIGATIONS.
INTERFACE TO PI/TL
SUPPORTS SPACECRAFT TESTING.

DATABASE ADMINISTRATOR

PROJECT DATABASE DEVELOPMENT, MAINTENANCE,
CONFIGURATION MANAGEMENT, DISTRIBUTION,
AND TESTING.

GROUND SYSTEM ENGINEER

SUPPORTS GROUND SYSTEM DEVELOPMENT,
MAINTENANCE., AND UPGRADES.
SUPPORTS DATABASE RELEASE TESTING.
SUPPORTS SOFTWARE RELEASE TESTING.

SYSTEM SPECIALIST

SUPPORTS GROUND SYSTEM ENGINEER IN GROUND
SYSTEM DEVELOPMENT, MAINTENANCE., AND
UPGRADES.
SUPPORTS DATABASE RELEASE TESTING.
SUPPORTS SOFTWARE RELEASE TESTING.

MISSION PLANNER

INTERFACE TO OFFLINE ENGINEERS AND PI/TLS FOR
SCHEDULING OF INST., S/C, AND NCC RESOURCES.
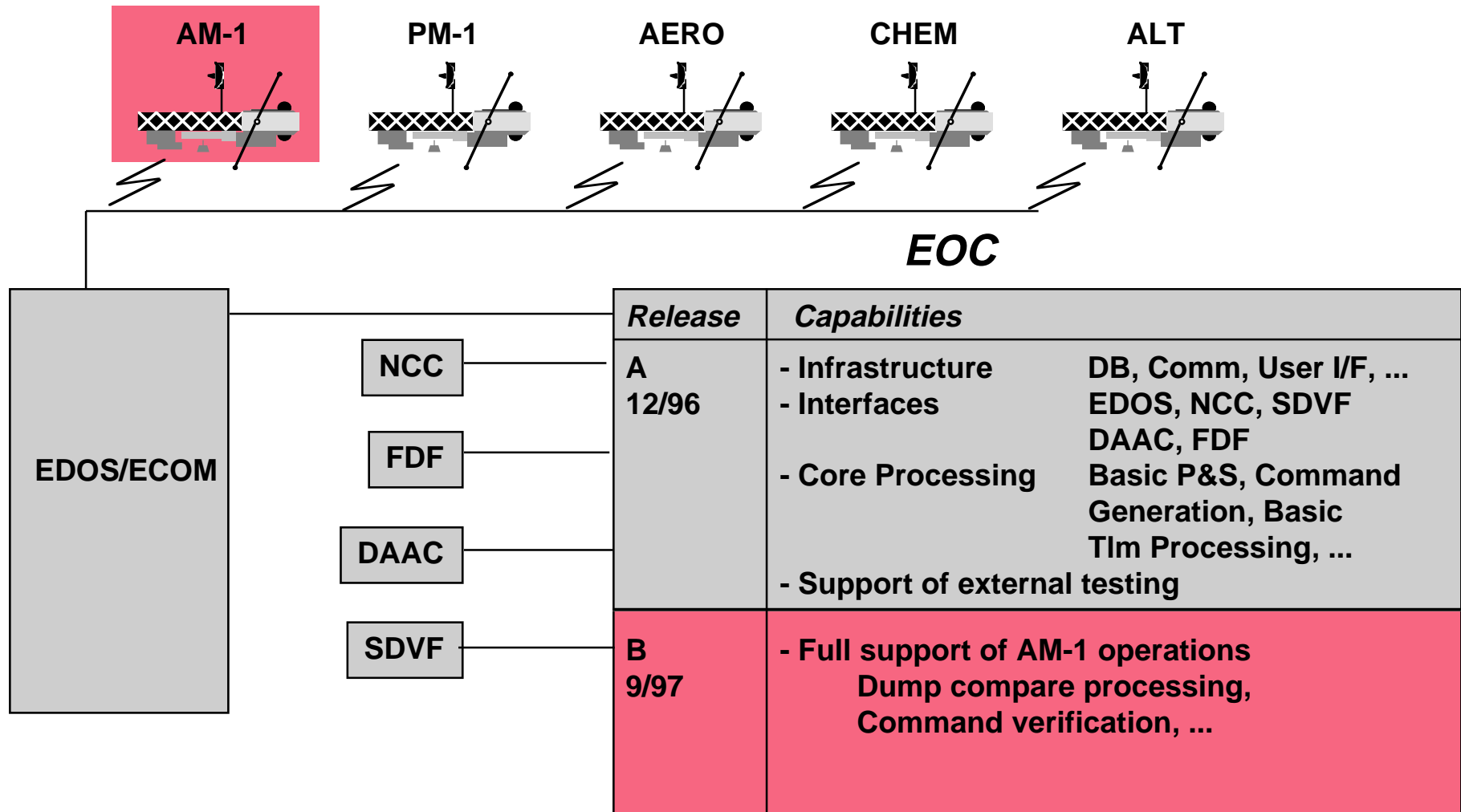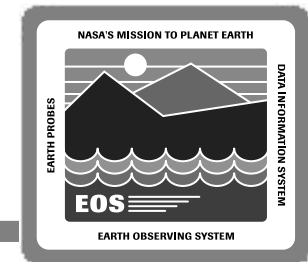PROVIDES TECHNICAL DIRECTION TO SCHEDULER
STAFF.

FOS System Sizing
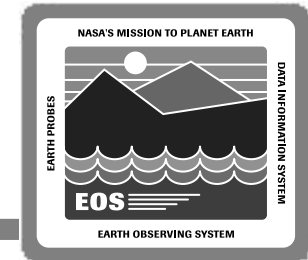
AM-1 and Multi-Mission support			
Subsystem	**eKloc**	**Reuse Kloc**	**Total SLOC**
Planning and Scheduling	100	127	227
Command Management	42	37	79
Command Processing	25	20	45
Telemetry Processing	20	41	61
Analysis	27	11	38
Data Management	65	73	138
Resource Management	33	30	63
User Interface	59	38	97
TOTAL	371	377	748

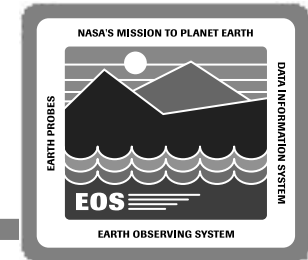**Note 1: Reuse figures include EOC developed S/W reuse for ICC functions**

**Note 2: Figures include prototype S/W**

FOS Release Capabilities

AM-1 **PM-1** **AERO** **CHEM** **ALT**

EOC

EDOS/ECOM

NCC

FDF

DAAC

SDVF

Release	Capabilities	
A **12/96**	- Infrastructure	DB, Comm, User I/F, ...
	- Interfaces	EDOS, NCC, SDVF DAAC, FDF
	- Core Processing	Basic P&S, Command Generation, Basic Tlm Processing, ...
	- Support of external testing	

B
 9/97
	- Full support of AM-1 operations
	     Dump compare processing,
	     Command verification, ...	

FOS Interface Tests

EOS-AM-1 GROUND DATA SYSTEM I&T SCHEDULE

| Test Name	Date	Description
Data Analysis Test	2/97-3/97	ETS sends Housekeeping data to EOC and DPF through the DIF.
Telemetry and Command Data Processing Test	3/97-4/97	EOC sends R/T commands to ETS through DIF. ETS processes commands, sends housekeeping data through DIF to EOC , DPF with command verification in telemetry.
Command Mangement Test	4/97 - 5/97	EOC builds ATS, RTS, R/T command loads, sends them to ETS. ETS processes commands, sends housekeeping data through DIF to EOC with command verification in telemetry.
Mission Data Processing Test	10/97 - 1/97	ETS sends all data VCs through DIF to DPF, EOC. DFP processes data and sends to EOC and DACCs.
OBC Data Management Test	11/97 - 12/97	EOC will produce OBC loads and send them to SSIM and ETS. SSIM will process OBC loads and send OBC table dump to EOC. EOC will perform OBC image/dump comparisons. ETS will process commands and through DIF will send command verification in telemetry to EOC.
Scheduling/Planning Support Test	1/98 - 2/98	DAACs send long term scheduling information to EOC. FDF sends scheduling information to NCC/EOC. EOC/ICC schedules AM-1 events through NCC. NCC sends confirmed AM-1 schedule to EOC. Tests run according to schedule. (also performed using DSN, WOTS, GN.)
Telemetry, Tracking, and Command	1/98 - 4/98	Prime antenna systems of TDRSS, DSN, WOTS, GN, support uplink and downlink frequencies for AM-1. TDRSS/DSN/WOTS/GN sends tracking data to FDF, S/C data to EOC and DPF via DIF. EOC forwards attitude telemetry dat to FDF. EOC sends commands to AM-1/ETS.
AM-1 Launch Site Readiness Test	3/98 - 5/98	ETS (portable)/AM-1 will send data from VAFB to DIF. DIF will send data to EOC and DPF. DPF will forward processed data to DAACs, EOC will send attitude data to FDF. EOC will send commands to ETS/AM-1 at VAFB.
Fully Integrated GDS I&T	3/98 - 4/98	All command interfaces and types are checked. All scheduling functions and interfaces are checked. All S/C data and types are checked. DPF processes data and forwards to DAACs.

FOS Threads
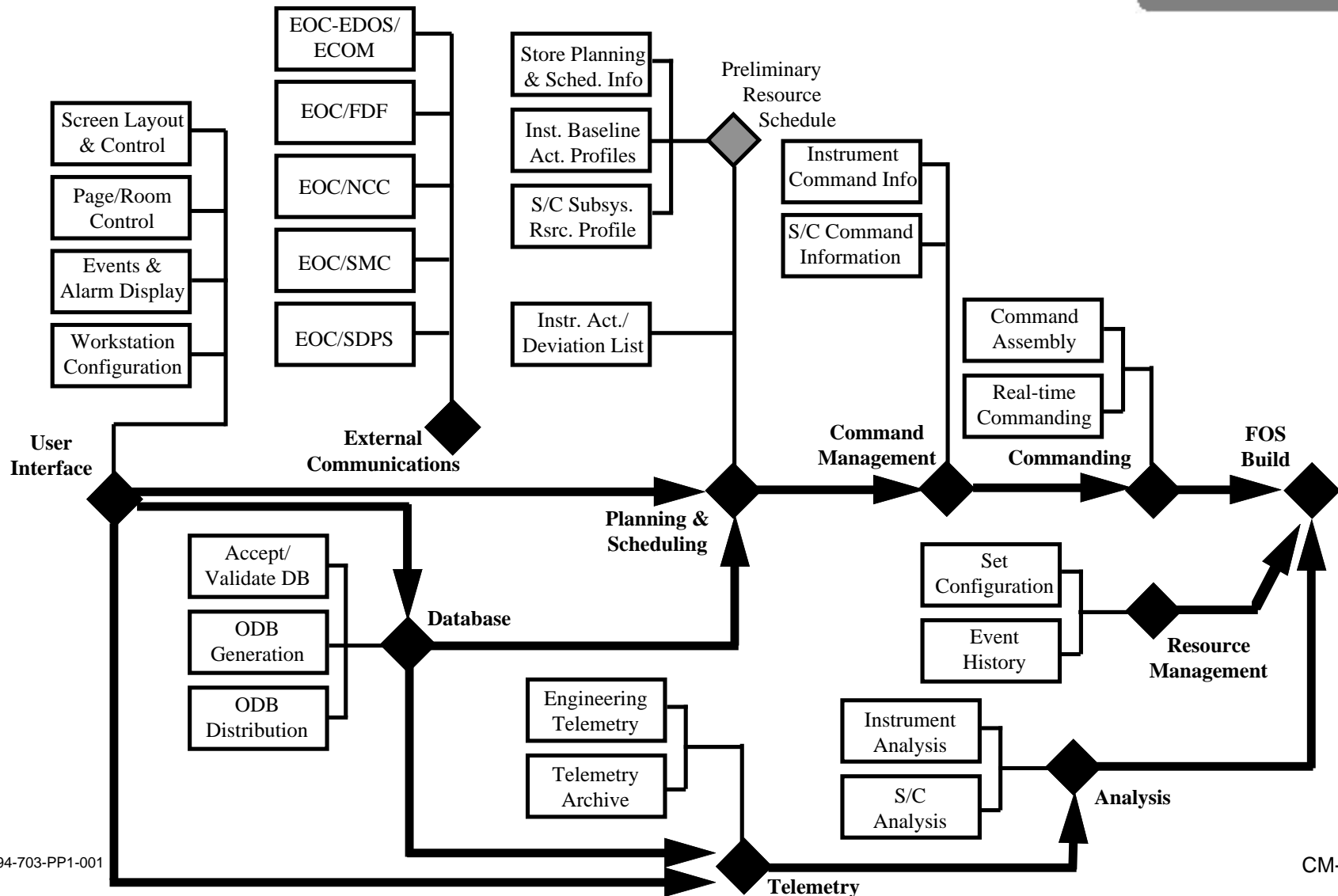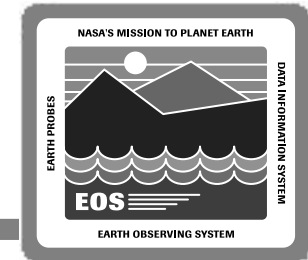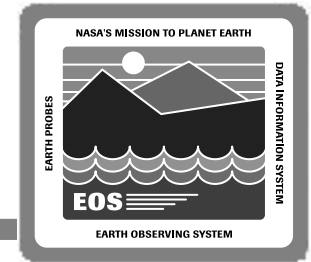
CM-10

FOS Near Term Schedule

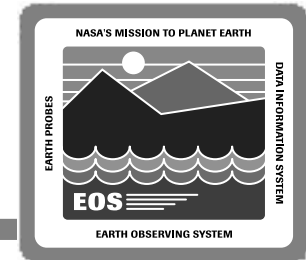Not available electronically.

FOS Near Term Schedule
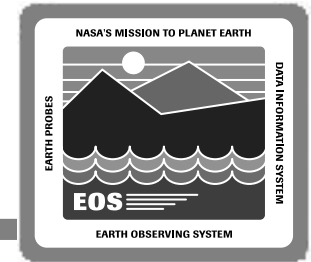
Not available electronically.

FOS Near Term Schedule
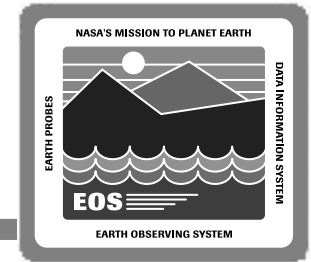
Not available electronically.

FOS Needs/Dependencies

Items	Date
MMC Ground System Req DB	**7/15**
Interface Definitions	**8/1**
• **FDF, NCC, EDOS,**	
• **Ecom, SDVF**	
ASTER	
• **Operations Concept**	**7/15**
• **Requirements**	**8/15**
• **ICD**	**9/1**
Instrument Requirements	**8/15**

PRR Invitation
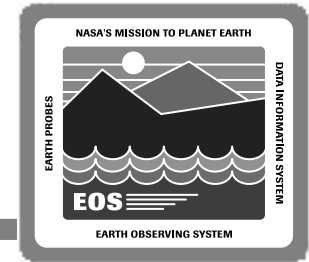
Prototype Results Review

- **9:00 - 12:00**
- **Landover Facility (see maps provided)**

Agenda

- **IST Presentation and Demo**
- **Planning and Scheduling Presentation and Demo**
- **Command Management Presentation**
- **Decision Support System Presentation**